

**OCR**

Oxford Cambridge and RSA

An OCR endorsed  
teaching and learning tool

# OCR A Level

Computer  
Science

H446 – Paper 1



## Client-server and peer-to- peer

Unit 5

Networks and web  
technologies



**PG ONLINE**

# Objectives

- To understand the client/server and peer-to-peer models
- Describe situations where each model may be used
- To understand client and server side processing
- To identify the different uses of client and server side processing and describe situations when either may be most practical
- To identify the advantages and disadvantages of client and server side processing

# Web forms

- Web forms ask you to enter details
- If you don't enter the required information, the form will sometimes display an error message
  - Why is this?
  - How does the web page know there is an error?
  - Is this information passed to the web server?





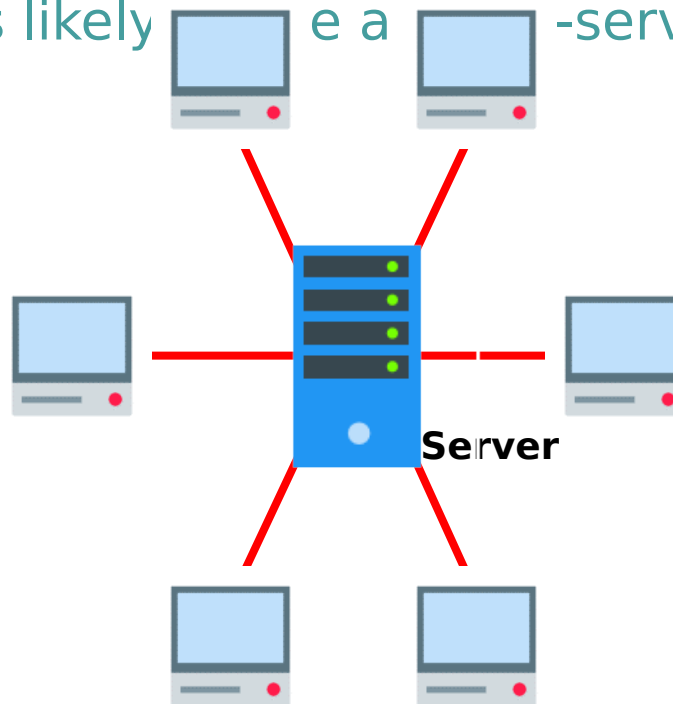
# Client-server model

- A network model consists of two parts: the **client** and the **server**
- The **client** accesses data, services and files from the **server**
- The **client** initiates communication to the server
- The **server** waits for requests from clients

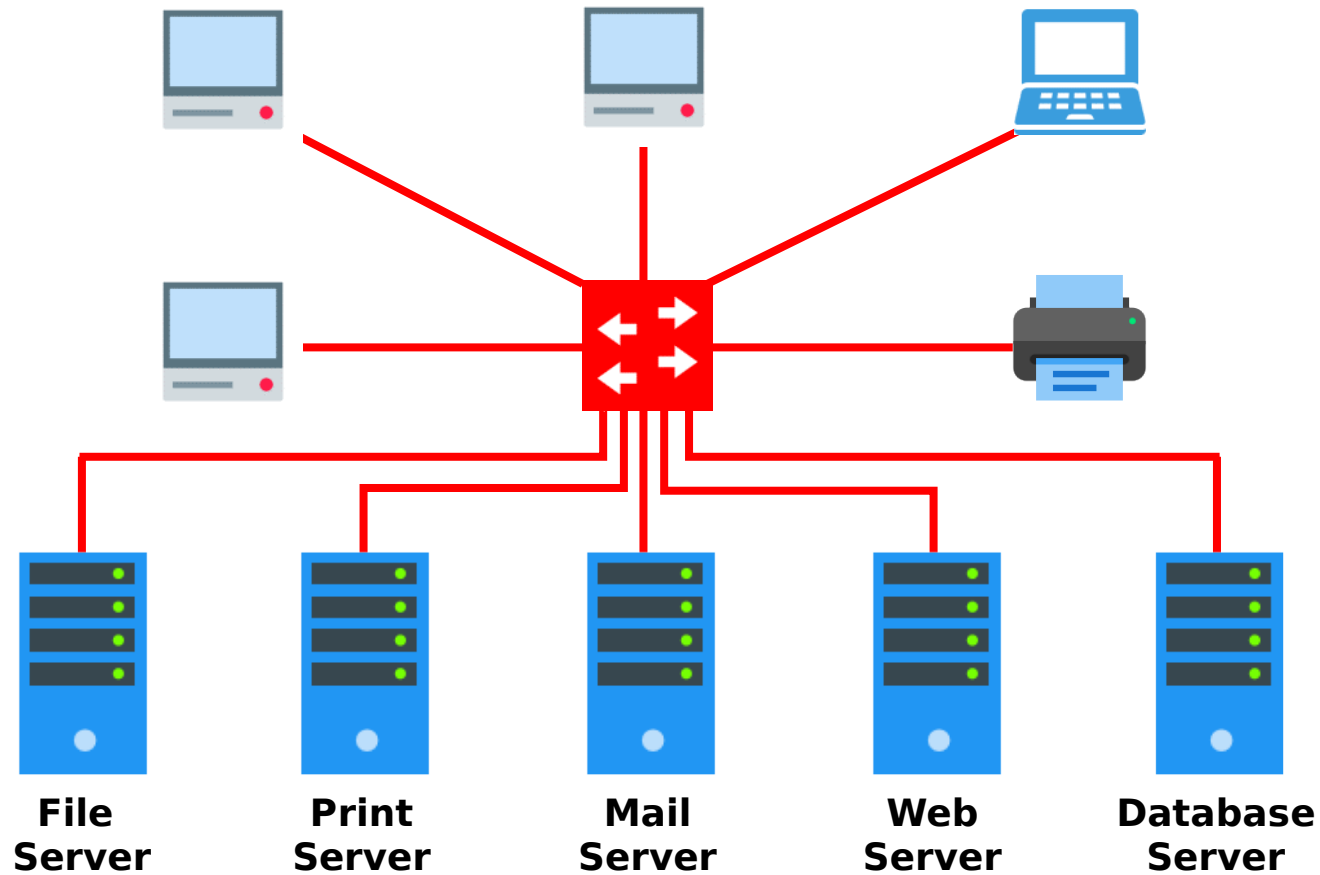


# Client-server architecture

- Terminals are known as 'clients' of the central server
  - A school is likely to be a client-server network



# Client-server architecture



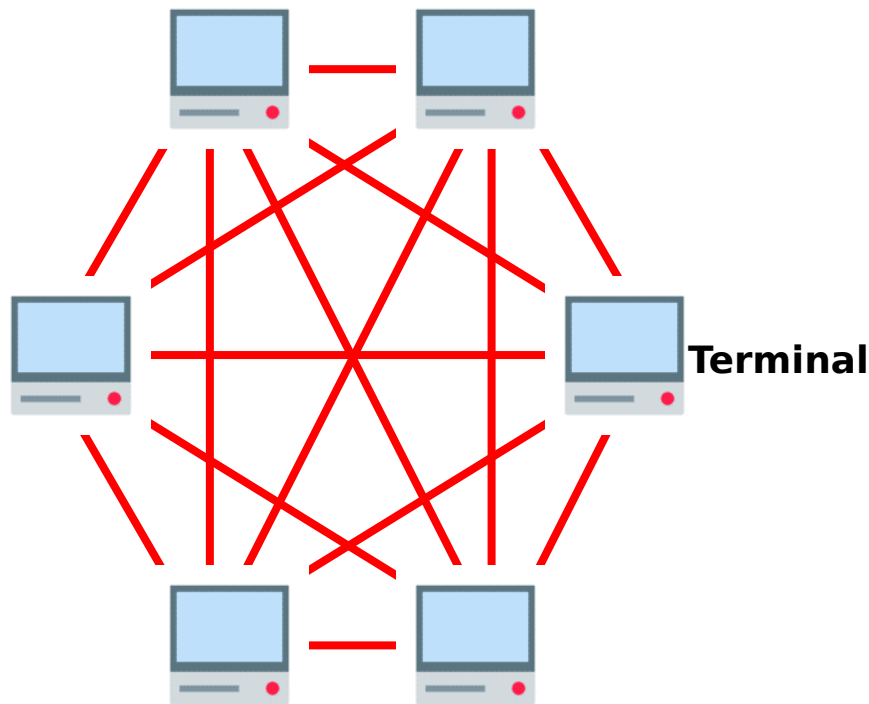
# Client-server networking

- Features of a client-server network include:
  - A central server is used to manage security
  - Some files are held on the central server
  - Some processing tasks are performed by the server
  - Clients issue requests to the server for services such as email, file storage, backup and printing
  - Suitable for many different types of organisation, small and large
  - Can require specialist IT staff to administer the network



# Peer-to-peer architecture

- A peer-to-peer network has no central server





# Peer-to-peer networking

- Features of a peer-to-peer network:
  - They are suitable for a small company or home network with a few computers
  - No central server controls files or security
  - All computers can see files on all other computers
  - All computers can communicate with each other without going through a server
  - If a computer is switched off, data cannot be retrieved from it



# Architecture summary

Client-server	Peer-to-peer
User IDs, passwords and access levels centrally controlled	Files and programs stored on individual computers
Used in many small, medium-size and large organisations	Suitable for a home computer network
Can be expensive to set up and to manage	Cheap to set up and maintain
Backup is centralised and usually automated	Each computer on the network can act as both client and server
No access to other users' files	Can be used for sharing of music and streaming coverage of live events

# Client processing

- Examples of “clients” include desktop computers, tablets, phones, games consoles or any other device that connects to a service
  - Data is processed **before** it is sent to a server by the **client**
  - On the web, this usually happens in the form of **scripts** and these are usually executed by the client browser
  - The web page does not communicate with the server at this point



# Client processing - JavaScript

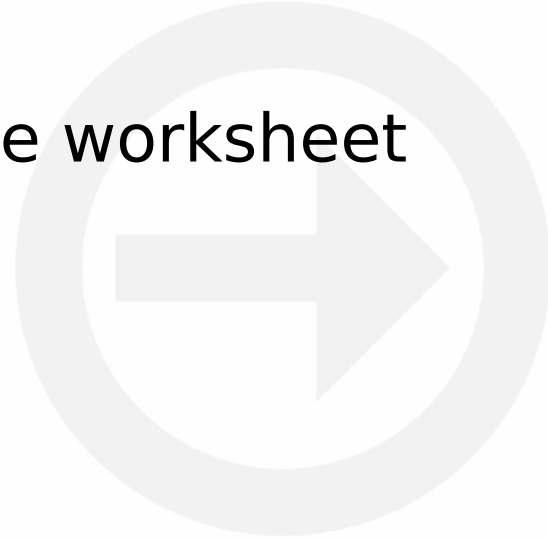
Web pages may feature **JavaScript** to validate data before it gets sent to the server for further validation

- The function **validate** offers client-side processing.  
What are the advantages of this?

```
<script>
function validate() {
    var x = document.forms["Form"]
    ["Name"];
    if (x.value == "") {
        x.style.borderColor = "red";
        alert("Name must be filled
out");
        return false;
    }
}
</script>
```

# Activity

- Complete **Activity 1** on the worksheet



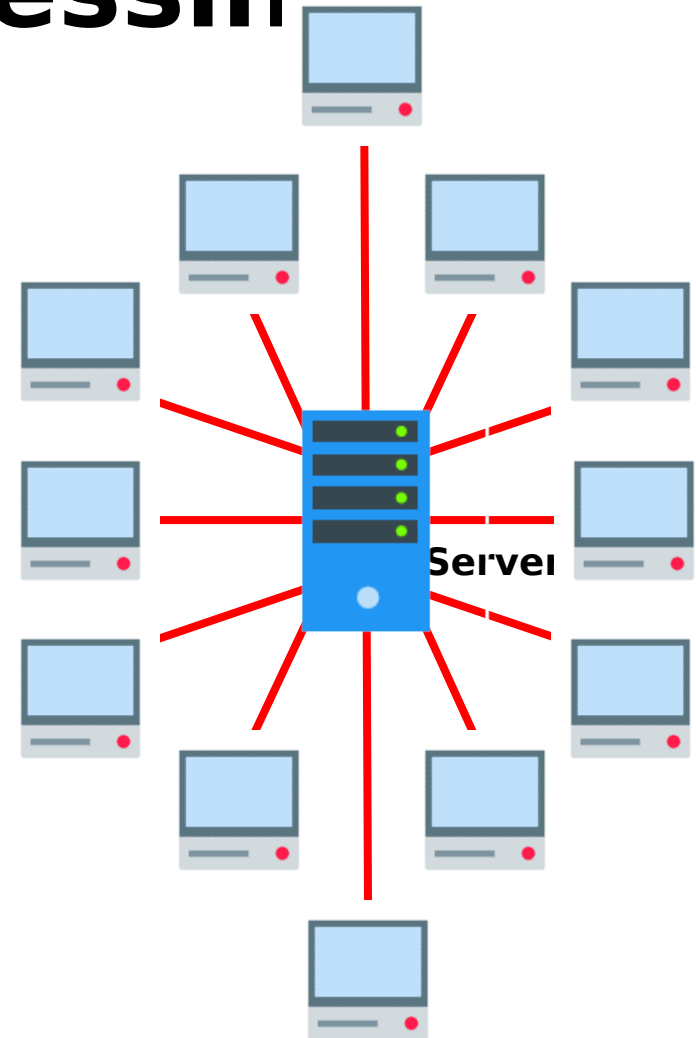


# Client processing - JavaScript

Advantages	Disadvantages
Allows for more interactivity by immediately responding to a users' action	Not all browsers support all scripts (although most modern browsers support an overwhelming majority)
Quick execution as no communication with the server is required	Because the scripts are processed by the client, they are dependent on the performance of the clients' machine
Removes potentially unnecessary processing from the server	Different browsers process scripts in slightly different ways, so the web page owner cannot be certain how the end-product will look to the user
Data cannot be intercepted on the way to the server, increasing security for the user	

# Client side processing

- Scripts that handle initial processing saves the server valuable processing resources
- Imagine if all of the terminals in this network had to communicate each time they needed to validate information
  - The server would eventually become overloaded and would crash



# Application Programming Interface (API)

- An API is a set of tools that can be used for building software applications
- API requests are processed by the client and responded to by the relevant server
  - An example is **Google Maps**



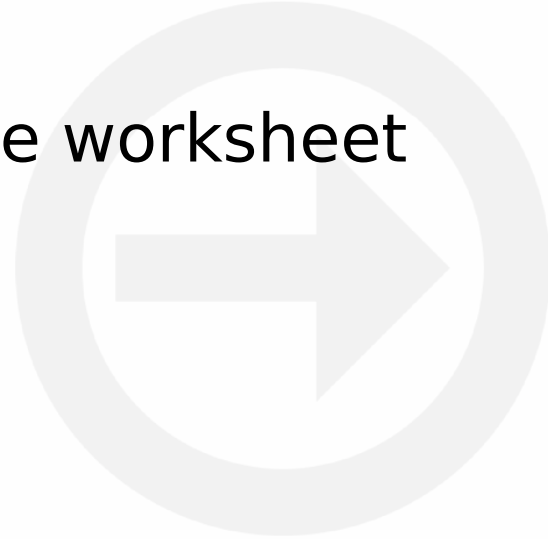
# API

- This simple line of code allows any web page to make use of the Google Map facility
  - The process is initialised and defined by the client
  - Once the API has been initialised, the web page can define how to interact and request data

```
<script src= "http://maps.googleapis.com/maps/api/js">  
</script>
```

# Worksheet

- Complete **Activity 2** on the worksheet





# Server side processing

- In certain cases, it is necessary for a server to process information to:
  - Process user input – providing another layer of validation
  - Display pages
  - Structure web applications
  - Interact with permanent storage/databases using SQL
- Server programming languages include:
  - Python
  - PHP
  - ASP



# Server side processing

- The client does not always have the capability to provide the data required to successfully process a request
- A company may hold sensitive data relating to the request
- The way the data is processed may also be a company secret and be protected by law
  - For example, Google PageRank



# Server side processing

- A server may wish to further validate data that has been submitted by the client
  - This may have already been validated by the client using JavaScript
  - JavaScript can be easily circumvented
  - This makes additional server-side validation crucial to accurate, secure data being transmitted



# Server side processing

- Search for an item on the Argos website



 HELP

 STORE LOCATOR

Search Argos...



Client processing	Server processing
Web page behaviour	Item stock level lookup
Style	Loading product information from the database
Form validation	Sending the request back to the client

# Client vs server side processing

Client Processing	Server Processing
1. Initial validation	1. Database queries
2. Web page interactivity	2. Encoding data to readable HTML
3. Manipulating interface elements	3. Updating the database
4. Applying styles (CSS)	4. Calculations
5. Reduces the load on the server	5. Provides further validation
6. Reduces the amount of web traffic	6. Keeps data owned by organisations secure





## **Copyright**

© 2016 PG Online Limited

The contents of this unit are protected by copyright.

This unit and all the worksheets, PowerPoint presentations, teaching guides and other associated files distributed with it are supplied to you by PG Online Limited under licence and may be used and copied by you only in accordance with the terms of the licence. Except as expressly permitted by the licence, no part of the materials distributed with this unit may be used, reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic or otherwise, without the prior written permission of PG Online Limited.

## **Licence agreement**

This is a legal agreement between you, the end user, and PG Online Limited. This unit and all the worksheets, PowerPoint presentations, teaching guides and other associated files distributed with it is licensed, not sold, to you by PG Online Limited for use under the terms of the licence.

The materials distributed with this unit may be freely copied and used by members of a single institution on a single site only. You are not permitted to share in any way any of the materials or part of the materials with any third party, including users on another site or individuals who are members of a separate institution. You acknowledge that the materials must remain with you, the licencing institution, and no part of the materials may be transferred to another institution. You also agree not to procure, authorise, encourage, facilitate or enable any third party to reproduce these materials in whole or in part without the prior permission of PG Online Limited.